File ACT/045/004

PRELIMINARY

Anaconda Copper Company
Carr Fork Operations

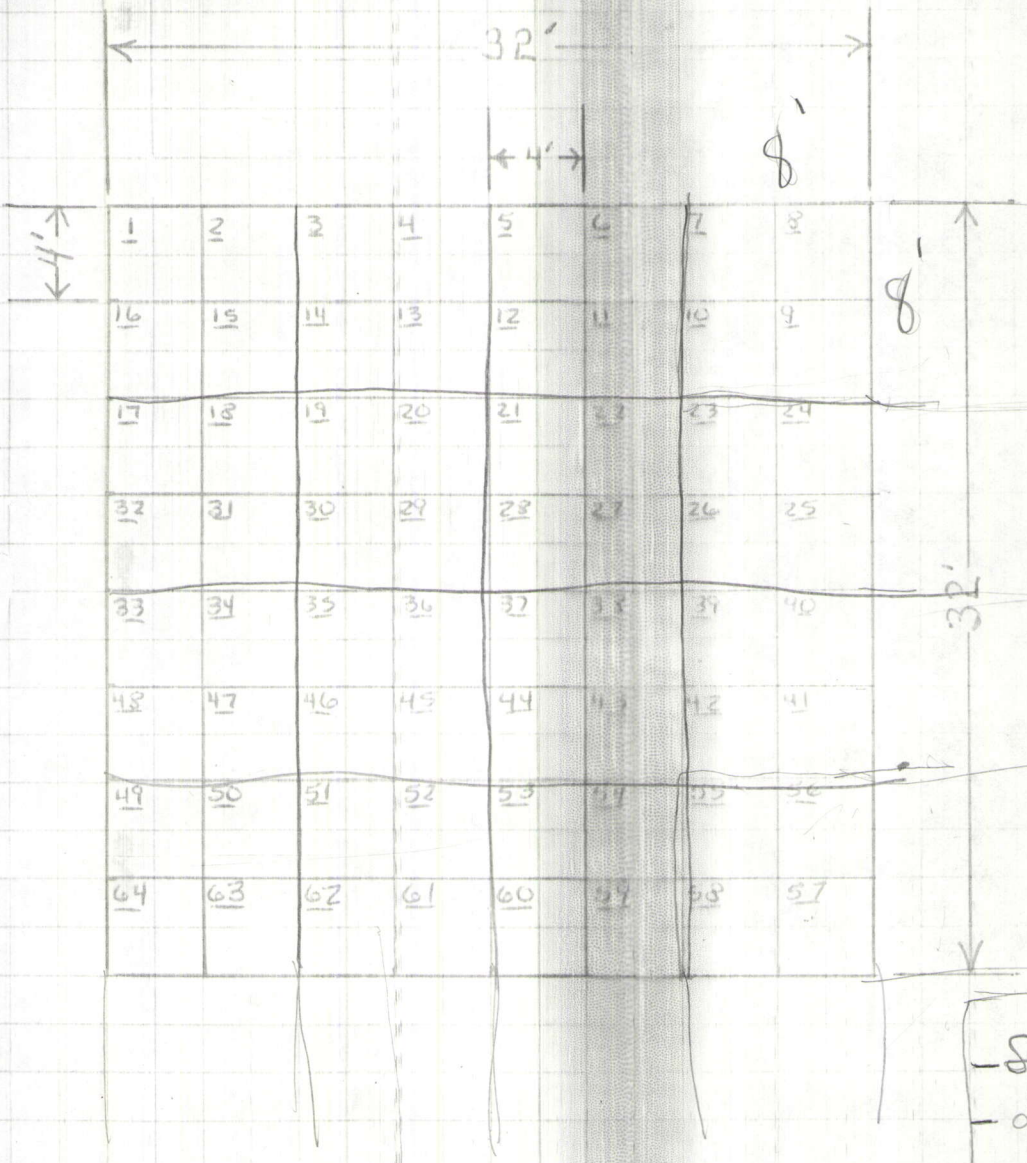
SITE REVEGETATION PLAN

Engineering Department
Environmental Section
January, 1981

ANCC-CF
Site Revegetation Plan

JANUARY, 1982

EXPERIMENTAL TEST PLOTS W/ NUMBERED SUBPLOTS



- Sertilizer
- drip irrigation
- topsoiling (for seeded sites)
- mulching

TABLE 7

ANCC-CE JANUARY, 1981

SITE REVEGETATION PLAN

EXPERIMENTAL TEST PLOTS W/ NUMBERED SUBPLOTS

32′ (width); 4′ (each subplot)

1	2	3	4	5	6	7	8
16	15	14	13	12	11	10	9
17	18	19	20	21	22	23	24
32	31	30	29	28	27	26	25
33	34	35	36	37	38	39	40
48	47	46	45	44	43	42	41
49	50	51	52	53	54	55	56
64	63	62	61	60	59	58	57

4′ (each subplot); 32′ (length)

TABLE 7

ANCC-CF
SITE REVEGETATION PLAN

JANUARY, 1982

EXPERIMENTAL TEST PLOTS W/ NUMBERED SUBPLOTS

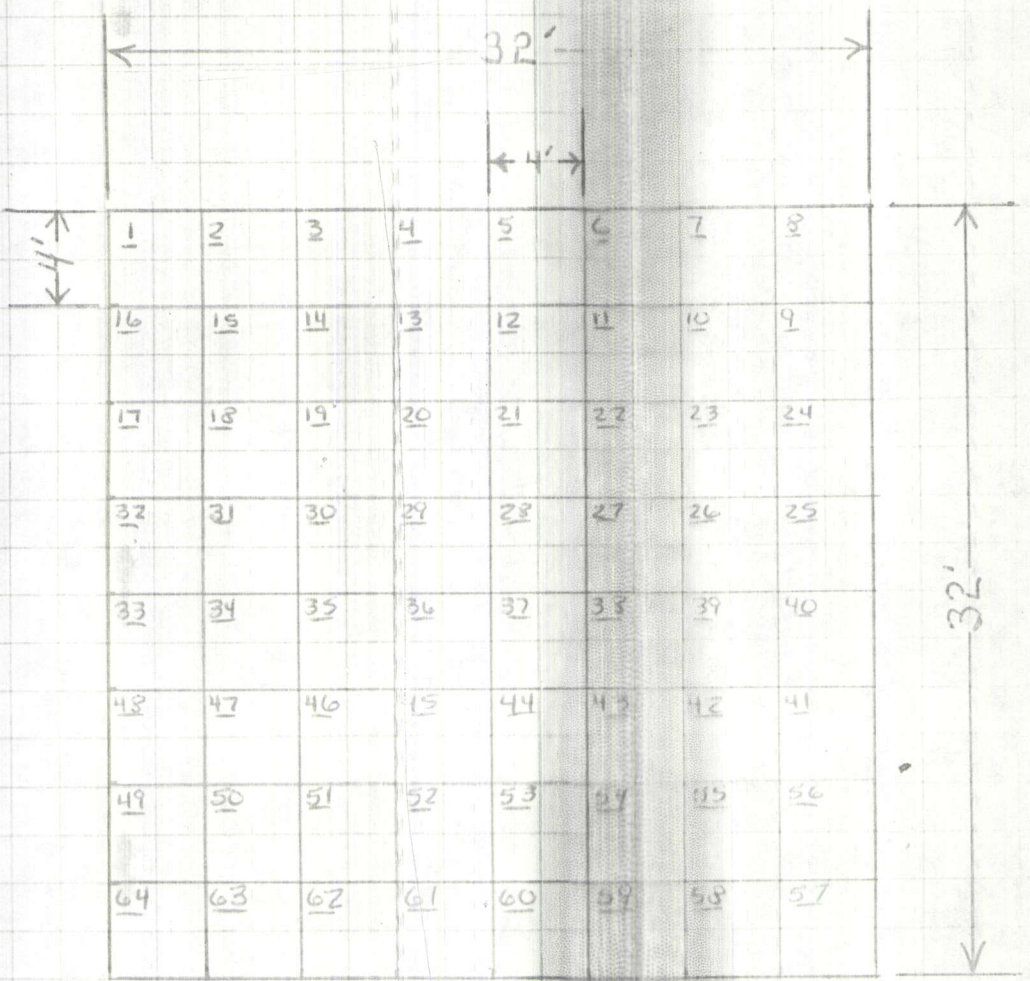


TABLE 7

ANCC - C.F.
Site Revegetation Plan

January, 1981

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I. INTRODUCTION

A. Scope

The plan presented herein is a guide to practices for re-establishing native, self-prapogating vegetation on approximately 700 acres of physically disturbed land owned by the Anaconda Copper Company and constituting the Carr Fork Operations. A five (5) year experimental program will be performed in accordance with the Mined Land Reclamation Contract, dated August 20, 1980 between the Anaconda Copper Company and the State of Utah, Department of Natural Resources, Bureau of Oil, Gas & Mining (see Appendix 1). Successful results obtained from the experimental program will be utilized in the long-term program during the following twenty (20) year period for selected large scale areas. An ultimate revegetation expenditure commitment for a minimum of $200,000 will be spent upon the closure of the Carr Fork Operations.

The objective of this Plan is to restore the portions of the Carr Fork Operations property which received physical disturbance as a result of mining activities to similar vegetative types found in the adjacent, relatively undisturbed Middle Canyon (see Figure 1, General Area Drawing). It should be noted that mine rock waste disposal piles and pre-Carr Fork Operations slag dumps (from International Smelting & Refining Operations) are not considered suitable for revegetation effort and are therefore not included in the scope of this Plan.

B. Project Description

The Carr Fork Operation is an underground copper ore mine and surface plant with a mine design production rate of 10,000 tons of ore per day. The ore is hoisted to the surface in the production shaft located in Pine Canyon. Three (3) additional shafts also serve the mine: the exhaust air shaft located on the Kennecott Copper Corporation-Bingham Pit site; the service shaft located near the production shaft in Pine Canyon; and the fresh air shaft located approximately one (1) mile inside the mountain range separating the Carr Fork Operation from the Bingham Pit Operations. Upon reaching the surface, the ore is stockpiled, from which it is conveyed to the secondary crushing plant. The fine ore is then conveyed 900 meters down Pine Canyon and stockpiled.

The fine ore is then conveyed to the concentrator for grinding and flotation separation. The ore concentrate is then filtered and stockpiled for shipment, while the tailings are discharged to two (2) 225 foot diameter gravity thickeners. The thickened tailings underflow is transported by gravity flow to the tailings pond 4 Km west of the plant for impoundment. (See Figure 2, Plant Perspective, Drawing 70000-M-202 Rev. 3).

reclamation of t. ponds?

C. Site Description

The Carr Fork Operations site is in Pine Canyon (Tooele County), 35 miles southwest of Salt Lake City, Utah, near Tooele, Utah. The canyon appears to have resulted from weathering of a fault which trends approximately along its longitudinal axis. The canyon walls are outcropping rock in the upper regions and talus slopes in the lower regions which are generally at the limiting angle of repose. In many places along the canyon evidence exists of slides and alluvial fans. The main drainage of the basin flows down the canyon over a bed of sandy gravel at an average slope of 15 percent. The width of the canyon between the toes of the canyon walls varies between 200 and 350 feet. The canyon walls are almost void of topsoil and are sparsely vegetated. The tailings impoundment area at the mouth of Pine Canyon has soil characteristics generally classified as silt-loom with clay in some areas. The mean annual precipitation and temperature in nearby Tooele, Utah are approximately 16 inches and 62° Farenheit, respectively.

% cover?

D. Summary

The revegetation plan will concentrate on physically disturbed sites at the Carr Fork Operations. Effort will be expended in three (3) stages: 1) a five (5) year experimental program, 1981 through 1985; 2) a twenty (20) year long-term program utilizing and monitoring experimental results on a large scale; and 3) final revegetation of physically disturbed sites upon closure of the Carr Fork Operations utilizing proven techniques established in 1 and 2, aforementioned.

II. EXPERIMENTAL PROGRAM

A. Introduction

The experimental program will be initiated during the spring of 1981 and conclude during the fall of 1985. Experimental plots will be utilized to evaluate revegetation species and techniques for the Carr Fork Operations disturbed sites. The experimental plots will be established on presently disturbed sites that will undergo no further disturbance during the life of the Carr Fork Operations.

B. Experimental Site Selection

Site selection analyses and planning are essentially completed for the experimental plots. Factors considered during this planning were elevation, surface slope, exposure, and susceptibility to further disturbance. This information is presented on Tables 1 through 6 for the respective experimental plots. Figure 3, "Experimental Plot Locations with Elevations", Drawing 50000-Y-001 Rev. 2, details selected experimental plot locations and provides visual highlighting of elevation bands within the Carr Fork Operations property.

Extensive evaluation of each experimental plot site will be conducted prior to commencement of any revegetation work. Physical and chemical properties of the soils, including metals, moisture, nitrogen, phosphorous, potassium, pH and salinity will be evaluated, with the results reflected in the final species selection for each plot. Modifications may be made to the soil to accommodate native species.

Surface runoff and erosional problems will be minimized. Long steep slopes will be avoided when possible, and terracing will be instituted on selected experimental plots. All plots should accommodate anticipated high-intensity, short-duration summer storm.

The soil on the experimental plots will be rendered firm (but not compacted), relatively smooth and as free from resident plant competition as is practicable. Irrigation will not be considered in this program.

C. Species Selection Criteria

The primary emphasis in selection of species for the Revegetation Plan is to establish similar vegetative types as are found in the adjacent Middle Canyon area.

ANCC - C.F.
Site Revegetation Plan

January, 1981

Native species are generally preferred because of their witnessed natural adaptation to the existing ecological conditions of the area in which they are growing. The plant species, as described in Tables 1 through 6 for each of the experimental plots respectively, indicate a variety mixing to provide ultimate community diversity and ecological stability. Deep-rooted trees and shrubs will provide protection against mass soil slippage, while grasses will enhance soil surface stability and provide ground cover. Environmental variables within each plot site, as described in II, B, will also reflect in the final species selection.

Preliminary

EXPERIMENTAL PLOT #1

Location - Upgrade (SE) of Mine Office Building

Orientation - Northwest

Elevation - 6600 feet

Existing Conditions - Disturbed; Graded

Recommended Experimentation Species -

Large Trees: Douglas Fir

Medium/Small Trees: Gambel Oak

Herbs/Shrubs/Bushes: Common Lilac
Serviceberry
Chokecherry

Grasses: Slender Wheatgrass
Intermediate Wheatgrass

Revegetation Techniques: Seed and Plant

Slope 41%

Contoured area

TABLE 1

Preliminary

EXPERIMENTAL PLOT #2

Location - Upper Bench at Mill Process Water Tank

Orientation - North

Elevation - 6000 feet

Existing Conditions - Disturbed; graded

Recommended Experimentation Species -

Large Trees: Box Elder

Medium/Small Trees: Pinyon Pine
Gambel Oak

Herbs/Shrubs/Bushes: Big Sagebrush
Antelope Bitterbrush

Grasses: Bluebunch Wheatgrass
Intermediate Wheatgrass

Revegetation Technique - Seed and Plant - Seed

Slope ~20%

TABLE 2

Preliminary

EXPERIMENTAL PLOT #3

Location - Northwest foundation slope downstream of #2 thickener tank

Orientation - Northwest

Elevation - 5700 feet

Existing Conditions - Graded; Hydro-seeded Spring 1980; Natural Species Introduced

Recommended Experimentation Species -

Large Trees: None (due to foundation stability)

Medium Trees: None (due to foundation stability)

Herbs/Shrubs/Bushes:
- Chokecherry
- Elderberry
- Antelope Bitterbrush
- Big Sagebrush
- Rubber Rabbitbrush

Grasses:
- Bluebunch Wheatgrass
- Intermediate Wheatgrass

Revegetation Technique: Seed and Plant

TABLE 3

Preliminary

EXPERIMENTAL PLOT #4

Location - Upper Smelter bench at landfill area (and below)

Orientation - North

Elevation - 5500 feet

Existing Conditions - Disturbed, some grading

Recommended Experimentation Species -

Large Trees: Box Elder

Medium/Small Trees: Bigtooth Maple
Pinyon Pine

Herbs/Shrubs/Bushes: Big Sagebrush
Rubber Rabbitbrush
Antelope Bitterbrush
Smooth Sumac

Grasses: Bluebunch Wheatgrass
Intermediate Wheatgrass

Revegetation Techniques: Terracing; Seed and Plant – fence

TABLE 4

Preliminary

EXPERIMENTAL PLOT #5

Location - East of main road at Well house below (N) #2 thickener tank

Orientation - West

Elevation - 5500 feet

Existing Conditions - Disturbed; graded. (Some natural)

Recommended Experimentation Species -

Large Trees: Box Elder
Douglas Fir — ornamental plantings only.

Medium/Small Trees: Pinyon Pine — Juniper
Bigtooth Maple
Gambel Oak

Herbs/Shrubs/Bushes: Common Lilac
Elderberry
Serviceberry
Black Chokecherry
may want to add more xeric shrubs.

Grasses: Bluebunch Wheatgrass
Kentucky Bluegrass
Intermediate Wheatgrass

Revegetation Techniques: Seed and Plant — fence

TABLE 5

Preliminary

EXPERIMENTAL PLOT #6

Location - South of main road at tailings return water pump house/helicopter pad area.

Orientation - Northwest

Elevation - 5400 feet

Existing Conditions - Graded; Hydro-seeded Spring 1980

Recommended Experimentation Species -

Large Trees: Box Elder
Douglas Fir

Medium/Small Trees: Pinyon Pine
Bigtooth Maple
Gambel Oak

Herbs/Shrubs/Bushes: Common Lilac
Serviceberry
Elderberry
Chokecherry

Grasses: Bluebunch Wheatgrass
Kentucky Bluegrass
Intermediate Wheatgrass

Revegetation Technique: Terracing; Seed and Plant - Seeded

Slope ~ 8%

TABLE 6

D. Management

Ongoing management of the experimental plots will be maintained to ensure high plant survival. Table 7 depicts the layout of the experimental plots. All plots, with the exception of Plot #1 will be fenced to prevent wildlife and/or human interference. Weedy plant competition will be minimized by ongoing weeding of the plots. Initial watering will be provided at the time of seeding and/or planting. Additional irrigation will not be considered in light of the scope of the Plan to establish self-sustaining vegetative cover.

Spring planting of all plots will be conducted to maximize the percent survival of the species revegetated as a result of low transpiration, low temperatures, and adequate soil moisture.

A detailed breakdown of sub-plot species ratio is not presented in this report pending finalization of species list and approval of preliminary Plan by the State of Utah, Division of Oil, Gas & Mining reclamation staff.

E. Evaluation

The revegetation experimental plots will be monitored closely during each of the growing seasons. Sub-plots showing minimal acheivements will be re-planted the following season utilizing more proven species or techniques.

Data concerning seedling emergence, estimated ground cover and rate of growth will be gathered for seeded species, while rate of growth and canopy cover parameters will be monitored for planted species. Other data will be collected if so advised by the Division of Oil, Gas and Mining. Pictorial essays will be obtained quarterly during the year(s) for each sub-plot and main experimental plot areas.

Data obtained from the experimental work will be submitted yearly with the "Annual Operations and Progress Report" required by the Division of Oil, Gas & Mining.

III. LONG-TERM PROGRAM

A. Description

Upon completion of the five (5) year experimental program, successful species and techniques for revegetation will be applied to larger areas disturbed by the Carr Fork Operations. Figure 4, "Proposed Areas for Long-Term Program Revegetation", Drawing 50000-Y-001 Rev. 2 depicts the approximate areas included in the long-term program. A correlation will be made between the large scale areas and the appropriate experimental plot on the basis of elevation, surface slope, and exposure. In addition, the potential for further disturbance of the large scale areas will be evaluated prior to final large scale area selection.

B. Management

The same management procedures will be followed that were developed for the experimental program, with the exception that fencing will not be utilized on the large scale areas due to operational difficulties and minimal anticipated benefits.

C. Evaluation

Evaluation will be performed similarly to procedures developed for the experimental program.

APPENDIX 1

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
BOARD OF OIL, GAS, AND MINING
1588 West North Temple
Salt lake City, utah 84116

* MINED LAND RECLAMATION CONTRACT *

THIS CONTRACT, made and entered into this 20th day of August, 1980, between The Anaconda Company a corporation duly authorized and existing under and by virtue of the laws of Delaware, and hereinafter called the Operator, and the Board of Oil, Gas, and Mining, duly authorized and existing by virtue of the laws of the State of Utah, hereinafter called the Board.

WITNESSETH:

WHEREAS, the Operator is the owner and in possession of certain mining claims and/or leases hereinafter more particularly mentioned and described in Exhibit "A" attached hereto.

WHEREAS, the Operator did on the 8th day of March, 1977, file with the Division of Oil, Gas, and Mining, a "Notice of Intention to Commence Mining Operations" and a "Mining and Reclamation Plan" to secure authorization to engage, or continue to engage, in mining operations in the State of Utah, under the terms and provisions of the Mined Land Reclamation Act, Title 40 Chapter 8, Utah Code Ann., 1953.

WHEREAS, the Operator is able and willing to reclaim the above mentioned lands in accordance with the approved mining and reclamation plan, the Mined Land Reclamation Act and the rules and regulations adopted in accordance therewith.

Approved as to Legal Considerations
Date 7/25/80

WHEREAS, the Board has considered the factual information and recommendations provided by the staff of the Division of Oil, Gas, and Mining as to the magnitude, type and costs of the approved reclamation activities planned for the land affected.

WHEREAS, the Board is cognizant of the nature, extent, duration of operations, the financial status of the Operator and his capabilities of carrying out the planned work.

NOW THEREFORE, for and in consideration of the mutual covenants of the parties by each to the other made and herein contained, the parties hereto agree as follows:

AGREEMENT

The Operator agrees:

1. To reclaim the land affected by mining activities in accordance with the Operator's mining and reclamation plan as approved by the Board on _____, 1980, the Mined Land Reclamation Act and its regulations adopted under such Act.

2. To conduct experimental reclamation studies during the period 1980 through 1985 implementing best available technology for reclamation of land impacted by mining and processing operations.

3. To apply results obtained from the experiments conducted under paragraph 2 above, and the latest technology available, for reclamation of areas disturbed by mining and processing operations upon abandonment of the operations. Approximately 500 acres will be reclaimed upon abandonment.

A minimum of $200,000 in 1980 dollars shall be expended upon abandonment for implementing and establishing the reclamation program and desired vegetative cover, respectively.

4. The above experimental and final reclamation efforts will be conducted pursuant to a commitment of the Operator to complete mined land reclamation as required by the Notice of Intention to Mine, the Mined Land Reclamation Act and implementing regulations.

5. The Operator agrees to provide to the Board and Division annually, a detailed report of the results of experimental reclamation of work performed during the preceding year, including an estimate of costs incurred for such experimental reclamation work expressed in 1980 dollars.

6. The Operator agrees to discuss the results of the previous year's experimental reclamation work with the Division in order to establish annual reclamation plans for the forthcoming year.

7. The Operator further agrees to work jointly with the Division in establishing annual reclamation plans for final reclamation work.

8. The Operator agrees to designate a responsible individual who is involved in the Operator's on-going experimental and final reclamation efforts, who will serve as liaison to the Division.

9. This contract shall be binding on all successors and assigns, to the Operator.

(60) days in which to remedy any such deficiencies. If at the end of such sixty day period the Operator has not remedied the deficiencies or made good faith efforts to remedy the deficiencies, the Operator shall be deemed to be in violation of the Mined Land Reclamation Act and this Contract and the board may initiate proceedings to terminate this Contract and the approved Notice of Intent to mine.

REVISION

1. This Contract is subject to amendment or revision to reflect future changes in the Mined Land Reclamation Act or its implementing regulations.

IN WITNESS THEREOF, the parties hereto set their hands this 20th day of August, 1980.

BOARD OF OIL, GAS, AND MINING

By C. B. Henderson

OPERATOR

By A. H. Ditto

A. H. Ditto

Its Carr Fork, General Manager

CORPORATE ACKNOWLEDGMENT

STATE OF UTAH)
) ss.
COUNTY OF Tooele)

On this 20th day of August, 1980, personally appeared before me A. H. Ditto, who by me duly sworn did say that he is the General Manager, Carr Fork of Anaconda Copper company and that the foregoing instrument was signed on behalf of said corporation by authority of a corporate resolution, and said Manager acknowledged to me that said corporation executed the same.

Notary Public: Nancy P. Stookey

Residing: Grantsville, Utah

My Commission Expires:

1/12/83

MR FORM 8
Page 1 of 2

Mine: Carr Fork Mine
Company: Anaconda Copper Company
File No:
Representative:
Address: R.F.D. 1, Box 79
Tooele, Utah 84074

Division of Oil, gas and Mining
1588 West North Temple
Salt Lake City, Utah 84116

Re: Commitment to Rule M-10

Gentlemen:

I hereby commit the applicant to comply with Rule M-10, "Reclamation standards" in its entirety, as adopted by the Board of Oil, Gas, and Mining on March 22, 1978.

The applicant will achieve the reclamation standards for the following categories as outlined from Rule M-10 on all areas of land affected by this mine, unless a variance is granted in writing by the Division.

Rule	Category of Commitment
M-10(1)	Land Use
M-10(2)	Public Safety and Welfare
M-10(3)	Impoundments
M-10(4)	Slopes
M-10(5)	Highwalls
M-10(6)	Toxic Materials
M-10(7)	Roads and Pads
M-10(8)	Drainages
M-10(9)	Structures and Equipment
M-10(10)	Shafts and Portals
M-10(11)	Sediment Control
M-10(12)	Revegetation
M-10(13)	Dams
M-10(14)	Soils

Approved as to Legal Considerations
Date 6/25/80
By

I believe a variance is justified on a site-specific basis for the following subsections of Rule M-10 for reclamation on this mine and have enclosed as an attachment to this letter a narrative statement setting forth a description of the extent of the variance request and factual reasons for said variance request.

Rule	Category of Variance Request (Narrative Attached)

STATE OF Utah

COUNTY OF Tooele

I, Art Ditto, having been duly sworn depose and attest that all of the representations contained in the foregoing application are true to the best of my knowledge; that I am authorized to complete and file this application on behalf of the Applicant and this application has been executed as required by law.

Signed: A. Ditto

Taken, subscribed and sworn to before me the undersigned authority in my said county, this 8th day of May, 1980.

Notary Public:

Nancy P. Stookey

My Commission Expires: My Commission Expires Jan 12 1983

APPENDIX 2

LIST OF REFERENCES

1. "Plant Ecology Notes". Botany 355 J. R. Habeck. University of Montana. 1979

2. "Final Report - Revegetation Studies for Disturbed Areas and Processed Shale Disposal Sites". Utah State University, Institute for Land Rehabilitation, College of Natural Resources, Agricultural Experiment Station. Logan, Utah.

3. "Proceedings: High-Altitude Revegetation Workshop No. 4". Colorado Water Resources Research Institute, Colorado State University. June, 1980.

4. "Revegetation of Acid Mining Wastes in Central Idaho" U.S.D.A. Forest Service Research Paper INT-178. Intermountain Forest and Range Experiment Station. 1976

5. "Selection, Propogation, & Field Establishment of Native Plant Species on Disturbed Arid Lands" Utah Agricultural Experiment Station, Institute for Land Rehabilitation. Bulletin 500, 1979

6. "Design Report-Tailings Embankment". Bechtel Corporation for Anaconda Copper Company. August, 1977